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THREE NEW SPECIES OF FROGFISHES FROM THE INDIAN AND PACIFIC OCEANS WITH NOTES ON OTHER SPECIES (FAMILY ANTENNARIIDAE)

By LEONARD P. SCHULTZ

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THREE NEW SPECIES OF FROGFISHES FROM THE INDIAN AND PACIFIC OCEANS WITH NOTES ON OTHER SPECIES (FAMILY ANTENNARIIDAE)

By Leonard P. Schultz

The purposes of this paper are: (1) to evaluate further certain diagnostic characters of frogfishes; (2) to call attention to nomenclatural changes; (3) to describe three new species; (4) to record specimens and data not available at the time I reviewed the family Antennariidae (Proc. U.S. Nat. Mus., vol. 107, no. 3383, pp. 47–105, 8 figs., 14 pls., 1957).

I am grateful to the staffs of the California Academy of Sciences (CAS), San Francisco, California; of the University of Hawaii (UH), Honolulu, Hawaii; and of the Division of Systematic Biology, Stanford University (SU), for permitting me to study the specimens in their collections. The following abbreviations, refer to other specimens recorded in this paper: RMNH (Rijikmuseum van Natuurlijke Historie, Leiden) and USNM (United States National Museum).

729-369—64

Diagnostic Characters

The study of additional material, not available previously, has enabled me to reconsider certain unsolved problems as well as to investigate new ones. My description of the bait as a "non-filamentous simple slender tentacle" has led to misinterpretation. This type of bait is considered to be a simple or unbranched central stalk, varying from a single slender threadlike tentacle to one that is somewhat fleshy, as contrasted to a tuft of tentacles or a bulbous base with tentacles. In addition, it should be understood that the bait is extensible and, when contracted, may be fleshy in nature; yet it retains the single central stalk.

Further attention has been given to the evaluation of the presence or absence of warts on the skin of frogfishes as a taxonomic character. Two species with warts were described by Bleeker, *Antennarius phymatodes* and *A. oligospilos*. During my examination of specimens of *A. moluccensis* Bleeker in the collection of the University of Hawaii, I encountered an abnormal specimen with "warts"—UH 403, collected at Diamond Head, Oahu, measuring 87 mm. from tip of snout to base of caudal fin. Dr. Victor G. Springer informed me that he investigated "warts" on a large frogfish collected in the Gulf of Mexico and that the warts were encysted nematodes. Thus, "warts" on the skin of frogfishes may be of questionable value in distinguishing species.

Briggs (Copeia, vol. 2, p. 440, 1962) distinguished *Antennatus reticularis* from *A. strigatus* on supposed differences in the length of the ilicium in relation to the length of the second dorsal spine and on the characteristic that the esca is blunt and lobed instead of lanceolate.

Rosenblatt (Copeia, vol. 2, pp. 462–464, 1963) investigated this problem by measuring the length of the ilicium and the second dorsal spine on 62 specimens, then analyzing his data statistically. He concluded that "only one population was represented in the sample." He compared the pectoral ray counts of *A. strigatus* and *A. bigibbus* and concluded that the eastern Pacific population of *A. strigatus* was distinct from the western Pacific population of *A. bigibbus*. This leaves the two species as valid and in agreement with the conclusions of Schultz (1957).

The importance of fin ray counts in the identification of frogfishes is evident when one studies table 1. I have added, therefore, the new counts made on the specimens listed below to my table 1 published in 1957. Additional counts are recorded from other specimens mentioned elsewhere in this paper as well as some furnished by Dr. Richard Rosenblatt.

Table 1 includes the nomenclatural changes discussed in this report.

Specimens Examined

Antennarius altipinnis

SU 30045, Taruna, Sangi Island, Sangir Islands, Herre, June 24, 1928, 31 mm.
SU 27238, Sitankai, Sulu, Philippines, Herre, August 7, 1931, 32 mm.
SU 27239, Dumaguete, Philippines, Herre, 19 mm.

Antennarius avalonis

CAS [no number], Guaymas, Sonora, Mexico, February 1951, 200 mm.
CAS 6627, latitude 0°55′S., longitude 90°31′W., Hancock Expedition, dredge 58–60 fathoms, Jan. 26, 1934, 68 mm.
CAS [no number], Guaymas, Mexico, D. A. Simpson, April 2, 1946, 3 specimens, 32–50 mm.
SU 9979, Santa Catalina Island, California, holotype of *A. avalonis* Jordan and Starks, 267 mm.
SU 16586, San Carlos Bay, Sonora, Mexico, June 1, 1950, 44 mm.
SU 14968, Rocky Bluff Bay, Sonora, Mexico, 13 mm.

TABLE 1.—*Counts recorded for species of Antennariidae*

Genera, subgenera, and species	Number of fin rays																		
	Soft dorsal						Anal					Pectoral†							
	11	12	13	14	15	16	6	7	8	9	10	7	8	9	10	11	12	13	14
Tathicarpus																			
*butleri**	3	–	–	–	–	–	–	3	–	–	–	3	–	–	–	–	–	–	–
butleri	1	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–
Trichophryne																			
rosaceus	–	2	–	–	–	–	–	1	1	–	–	–	–	–	4	–	–	–	–
*mitchelli**	–	–	1	2	–	–	–	–	2	1	–	–	–	–	1	2	–	–	–
Nudiantennarius																			
subteres	–	1	–	–	–	–	–	1	–	–	–	–	–	2	–	–	–	–	–
Abantennarius																			
duescus	–	2	–	–	–	–	–	2	–	–	–	–	–	4	–	–	–	–	–
analis	–	1	–	–	–	–	–	1	–	–	–	–	–	–	2	–	–	–	–
Rhycherus																			
*filamentosus**	–	–	3	–	–	–	–	–	3	–	–	–	–	–	–	3	–	–	–
Histiophryne																			
*bougainvilli**	–	–	–	–	3	–	–	–	3	–	–	–	3	–	–	–	–	–	–
*scortea**	–	–	–	–	3	–	–	–	3	–	–	–	–	–	1	2	–	–	–
Echinophryne																			
*crassispina**	–	–	–	–	1	1	–	–	2	1	1	–	–	–	1	2	–	–	–
*glauerti**	–	–	–	–	–	1	–	–	1	–	–	–	–	–	–	1	–	–	–
Phrynelox																			
Phrynelox																			
*striatus**	–	1	1	–	–	–	1	1	–	–	–	–	–	–	2	–	–	–	–
striatus	–	2	–	–	–	–	–	1	1	–	–	–	–	–	4	–	–	–	–
*melas**	–	2	–	–	–	–	1	1	–	–	–	–	–	–	2	–	–	–	–
scaber	1	49	1	–	–	–	–	50	1	–	–	–	–	–	5	61	–	–	–
lochites, new species	–	4	–	–	–	–	–	4	–	–	–	–	–	–	2	6	–	–	–
Triantennatus																			
cunninghami	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	–	–	–	–
zebrinus	–	6	–	–	–	–	1	5	–	–	–	–	–	–	10	1	–	–	–
atra	–	5	–	–	–	–	–	5	–	–	–	–	–	–	9	–	–	–	–
nox	–	7	–	–	–	–	–	7	–	–	–	–	–	–	1	12	–	–	–
tridens	–	42	1	–	–	–	–	43	–	–	–	–	–	–	7	66	4	–	–

TABLE 1.—*Counts recorded for species of Antennariidae*—Continued

Genera, subgenera, and species	Number of fin rays																		
	Soft dorsal						Anal					Pectoral†							
	11	12	13	14	15	16	6	7	8	9	10	7	8	9	10	11	12	13	14
Antennatus																			
Antennatus																			
bigibbus	–	11	3	–	–	–	–	12	1	–	–	–	–	–	2	27	–	–	–
strigatus	–	9	–	–	–	–	–	9	–	–	–	–	–	1	13	2	–	–	–
Golem																			
cryptacanthus	–	1	1	–	–	–	–	2	–	–	–	–	2	–	–	–	–	–	–
Lophiocharon																			
Lophiocharon																			
caudimaculatus	–	1	29	–	–	–	–	28	2	–	–	–	–	46	2	–	–	–	
Uniantennatus																			
campylacanthus	1	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–
horridus	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	2	–	–	–
*horridus**	–	2	2	–	–	–	–	–	3	1	–	–	–	–	1	2	1	–	–
*tenebrosus**	–	1	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–
tenebrosus	–	1	–	–	–	–	–	1	–	–	–	–	–	–	2	–	–	–	–
Antennarius																			
Fowlerichthys																			
radiosus	–	1	79	6	–	–	–	–	82	1	–	–	–	–	–	–	–	107	5
*radiosus**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	51	5
avalonis	–	2	29	1	–	–	–	–	30	1	–	–	–	–	–	–	–	59	–
*sarasa**	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–
ocellatus	–	–	17	–	–	–	–	–	17	–	–	–	–	–	–	3	26	3	
Antennarius																			
hispidus	–	1	3	–	–	–	–	4	–	–	–	–	–	–	8	–	–	–	–
*moluccensis**	–	–	2	–	–	–	–	–	2	–	–	–	–	–	–	2	–	–	–
moluccensis	–	1	13	–	–	–	–	5	9	–	–	–	–	–	9	17	–	–	–
*leucosoma**	–	1	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	–
pardalis	?1	–	–	–	–	–	–	–	?8	–	–	–	–	–	?1	–	–	–	–
chironectes	1	14	1	–	–	–	2	13	–	–	–	–	–	–	27	–	–	–	–
multiocellatus	1	6	–	–	–	–	1	6	–	–	–	–	–	–	13	–	–	–	–
phymatodes	1	3	–	–	–	–	–	4	–	–	–	–	–	–	6	–	–	–	–
japonicus, new species	–	1	–	–	–	–	–	1	–	–	–	–	–	–	2	–	–	–	–
indicus, new species	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	2	–
sanguineus	–	–	8	–	–	–	–	6	2	–	–	–	–	–	–	13	3	–	–
drombus	1	21	3	–	–	–	–	24	1	–	–	–	–	–	–	12	36	1	–
coccineus	–	24	–	–	–	–	1	22	–	–	–	–	–	3	43	1	–	–	–
bermudensis	–	2	–	–	–	–	–	2	–	–	–	–	–	2	2	–	–	–	–
*dorehensis**	–	1	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–
*notophthalmus**	–	3	–	–	–	–	–	3	–	–	–	–	–	3	1	–	–	–	–
notophthalmus	–	4	–	–	–	–	–	4	–	–	–	–	–	7	1	–	–	–	–
verrucosus	–	2	–	–	–	–	–	2	–	–	–	–	–	–	–	4	–	–	–
altipinnis	1	20	1	–	–	–	–	19	3	–	–	–	–	42	5	–	–	–	–
pauciradiatus	–	13	–	–	–	–	–	12	1	–	–	–	2	21	1	–	–	–	–
nummifer	–	22	–	–	–	–	–	22	–	–	–	–	–	–	34	4	–	–	–
Histrio																			
histrio	3	32	2	–	–	–	–	30	2	–	–	–	–	2	72	4	–	–	–

*Counts recorded from literature.

†Counts for both pectorals included when the number exceeds the count for the anal or dorsal rays.

Antennarius chironectes

CAS [no number], Honolulu, E. M. Ehrhorn, 1915, 18 mm.
CAS 6371, Honolulu, E. M. Ehrhorn, 92 mm.
CAS 7400, Honolulu, A. Seale, 1935, 93 mm.
SU 20463, Cagayancillo, Philippines, 63 mm.
SU 8468, Honolulu, *Albatross*, 1902, 2 specimens, 52 and 101 mm.
SU 8439, Laysan Island, holotype of *A. laysanius* Jordan and Snyder, 69 mm.
UH 2338, Waiamae, Oahu, Aug. 12, 1955, 150 mm.

Antennarius coccineus

CAS [no number], Pago Pago, Samoa, A. Seale, May 1929, 72 mm.
CAS [no number], Pago Pago, Samoa, A. Seale, May 1929, 70 mm.
UH 1159, Hull Island, Phoenix Islands, July 12, 1950, 74 mm.

Antennarius drombus

UH 1775, Hauula Park, Oahu, A. Tester, Jan. 21, 1953, one specimen
UH 531, Waikiki, Oahu, Cuttress, April 4, 1950, one specimen
UH 1832, Diamond Head, Oahu, one specimen
UH 1227, Waialea School, Oahu, Feb. 4, 1951, two specimens
UH 816, Diamond Head, Oahu, May 16, 1950, two specimens
UH 1995, Waimea, Oahu, July 25, 1955, 62 mm.
UH 338, Hauula Park, Oahu, June 28, 1949, 26 mm.
UH 1751, Waikiki, Oahu, 40 mm.

Antennarius multiocellatus

SU 52342, Port of Fortaleza, Brazil, Mucuripe, Feb. 23, 1945, 50 mm.

Antennarius moluccensis

CAS [no number], Hawaii, Thayer, Sept. 23, 1909, 111 mm.
CAS [no number], Hawaii, 173 mm.
SU 8455, Honolulu, 53 mm.
SU 8458, Honolulu, *Albatross*, 1902, 84 mm.
UH 148, off Oahu, 162 mm.
UH 1995, Waimea, Oahu, July 25, 1955, 36 mm.
UH 268, Waimea, Oahu, Feb. 22, 1949, 1 specimen
UH 403, Diamond Head, Oahu, Dec. 15, 1949, 87 mm.

Antennarius nummifer

SU 7600, Misaki, Japan, holotype of *A. sanguifluus* Jordan, 44 mm.

Antennaries notophthalmus

SU 27241, Unisan, Tayabas Province, Luzon, Philippines, Herre, Feb. 15, 1924, 2 specimens, 52 mm.

Antennarius sanguineus

SU 14967, Cleopha Island, Tres Marias Islands, Mexico, Feb. 23, 1940, 31.5 mm.

Antennatus bigibbus

SU 27236, Dumaguete, Philippines, Herre, June 20–26, 1931, 2 specimens, 23 and 34 mm.
SU 29562, Mabini, Batangas, Philippines, Herre, March 1933, 34 mm.
SU 8461, Honolulu, O. P. Jenkins, *Albatross*, 3 specimens, 15 and 19 mm.
SU 3247, Honolulu, O. P. Jenkins, 5 specimens, 19 and 24 mm.
UH 338, Hauula Park, Oahu, June 28, 1949, 33 mm.
UH 2100, three miles west of Lahaina, Maui, Aug. 5, 1955, 33 mm.

Antennatus strigatus

CAS W56–236, Clipperton Island, northeast side, Oct. 22–29, 1956, 34.3 mm.
CAS W58–296, Clipperton Island, Aug. 20, 1958, 20 mm. [abnormal dorsal fin with last 4 rays branched]
CAS W58–291, Clipperton Island, west end, Aug. 16, 1958, 22 mm.

Lophiocharon caudimaculatus

CAS [no number or locality], 5 specimens, 57 to 92 mm.
SU 39498, Singapore, Herre, Oct. 10, 1940, 2 specimens, 45 and 83 mm.
SU 30651, Singapore, Herre, March 14, 1934, 4 specimens, 39 to 81 mm.
SU 27872, Sandaken, British North Borneo, Herre, July 3, 1929, 3 specimens, 65 to 87 mm.
SU 32738, Singapore Harbor, Herre, May 7, 1937, 3 specimens, 53 to 69 mm.
SU 35781, Singapore Market, Herre, May 1937, 2 specimens, 84 and 85 mm.
SU 30652, Singapore, Herre, 2 specimens, 52 and 80 mm.
SU 20204, Cuyo, Philippines, R. C. McGregor, holotype of *A. lithinostomus* Jordan and Richardson, 84 mm.

Phrynelox atra

CAS [no number or locality, identification uncertain], 82 mm.
SU 9234, Port Jackson, Australia, 1 specimen
SU 3259, Honolulu, Jenkins, 1889, 60 mm.

Phrynelox nox

SU 7601 Japan, cotype of *A. nox* Jordan, 61 mm.
SU 7603, Nagasaki, Japan, holotype of *A. nox* Jordan, 84 mm.
SU 7599, Misaki, Japan, two cotypes of *A. nox* Jordan, 58 and 60 mm.

Phrynelox scaber

CAS 8819, Green Turtle Bay, Bahamas, 67 mm.

Phrynelox striatus

SU 9138, Port Jackson, Australia, 106 mm.
SU 20725, Lake Illawarra, Australia, 87 mm. [bait is abnormal with 5 branches]

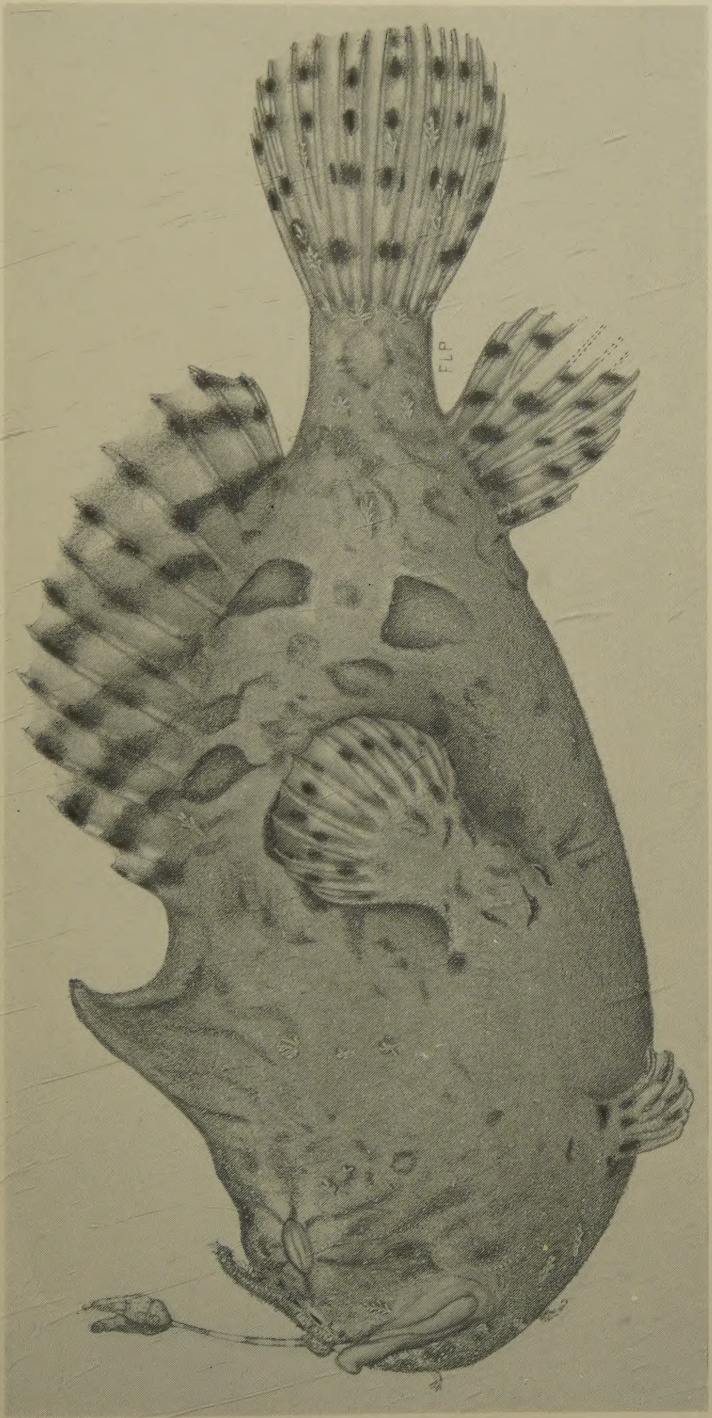

PLATE 1.—*Phrynelox lockitei*, holotype, SU 38194 (drawn by Mrs. Fanny Phillips).

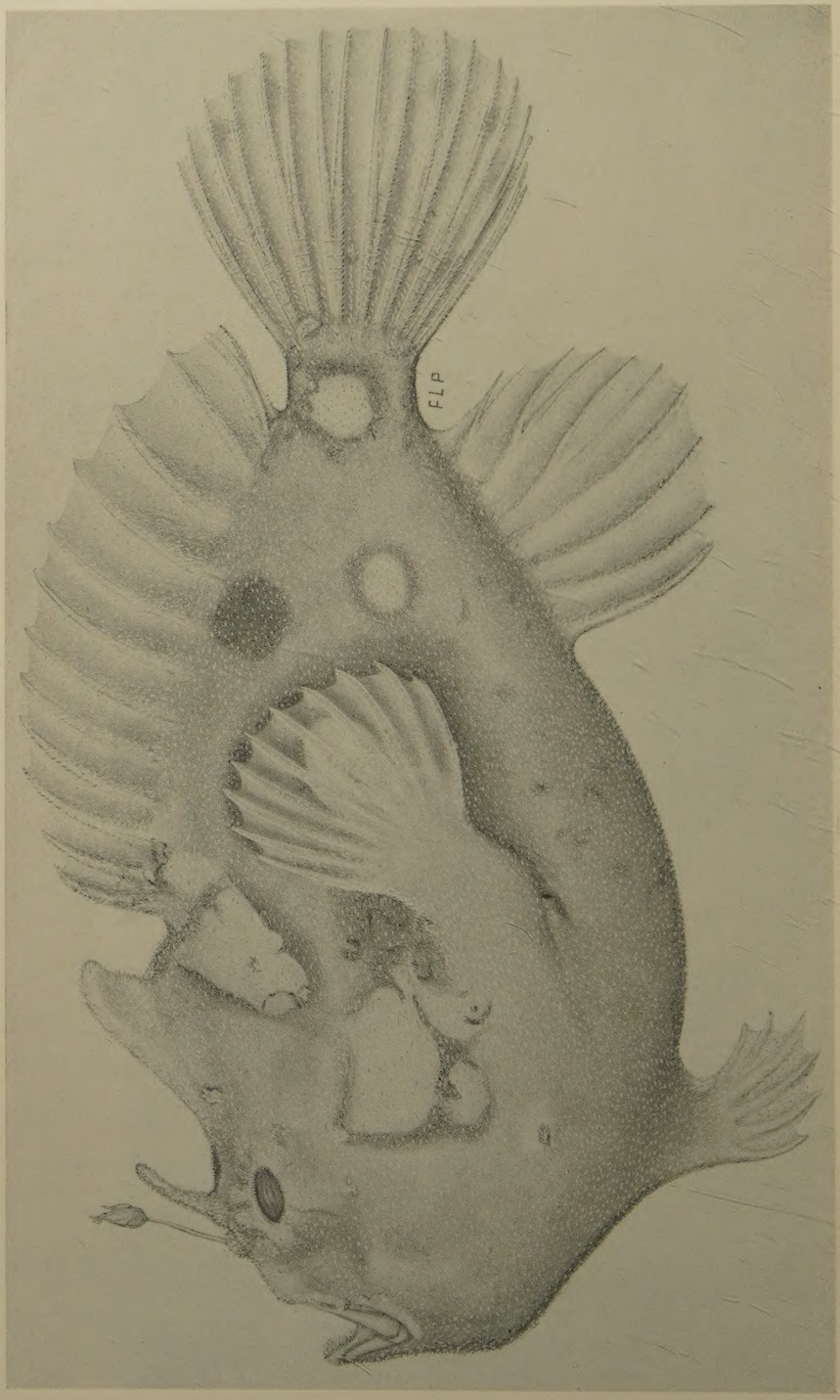

PLATE 2.—*Antennarius japonicus*, holotype, SU 26796 (drawn by Mrs. Fanny Phillips.)

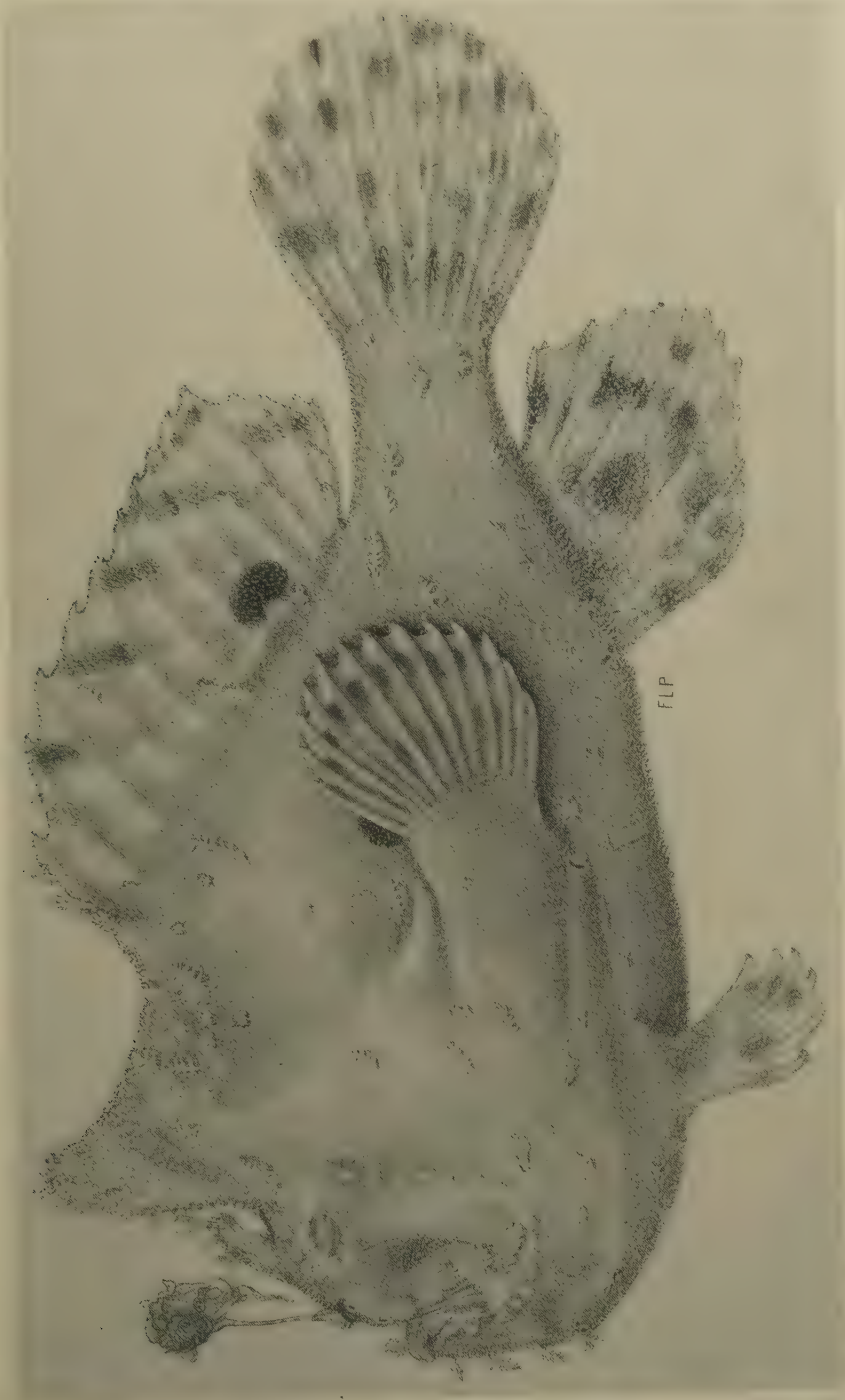

PLATE 3.—*Antennarius indicus*, holotype, SU 40090 (drawn by Mrs. Fanny Phillips).

Phrynelox tridens

CAS [no number], Tateyama Bay, Chiba Prefecture, Japan, Terazaki, Aug. 29, 1946, 59 mm.
CAS [IU 10680] Misaki, Sagami, Japan, Jordan and Snyder, 3 specimens, 49 to 52.5 mm.
SU 32414, Tinghai, Chusan Island, Cheking Province, China, 2 specimens, 47 and 63 mm.
SU 25636, Nagasaki, Japan, 39 mm.
SU 7227, Nagaski, Japan, 18 specimens, 27 to 59 mm. [one specimen has 4 tentacles]
SU 7228, Wakanoura, Japan, 7 specimens, 53 to 78 mm.
SU 23424, Wakanoura, Japan, 5 specimens, 42 to 59 mm.

Nomenclatural Changes

Three new frogfish names have been published since my review. Cadenat (Bull. Inst. Francais Afrique Noire, vol. 21, ser. A., no. 1, pp. 361–385, figs. 1–26, 1959) described *Antennarius* (*Fowlerichthys*) *senegalensis*, *A.* (*Triantennatus*) *delaisi*, and *A.* (*T.*) *occidentalis* as new species from off the west coast of Africa.

Golem Whitley

Xenophrynichthys Schultz (synonym).

The generic name *Golem* Whitley (type species, *Antennarius cryptacanthus* Weber), published May 8, 1957 (Proc. Roy. Zool. Soc. New South Wales, p. 70) has priority over *Xenophrynichthys* Schultz (Proc. U.S. Nat. Mus., vol. 107, no. 3383, p. 81, November 1, 1957), both with the same type species.

Antennarius radiosus Garman

Kanazawaichthys scutatus Schultz (synonym).

In 1957 (op. cit., p. 63) I described *Kanazawaichthys scutatus* on prejuvenile specimens, characterized by having two pairs of enlarged bony plates on the head. Hubbs (Copeia, no. 4, pp. 282–285, 1958), with additional specimens and aided by me in a restudy of still more specimens, concluded that *K. scutatus* is the prejuvenile of *A. radiosus*, an opinion with which I concur.

Maul (Bocagiana, Mus. Mun. Funchal, no. 1, p. 15, 1959) records a large specimen of *A. radiosus* from Madeira, and Palmer (Ann. Mag. Nat. Hist., ser. 13, vol. 3, pp. 149–151, 1960) records a prejuvenile *A. radiosus*, 13 mm. in standard length, off the West Coast of Ireland, 54°10′ N., 12°10′ W.; thus, this western Atlantic species occasionally occurs in the eastern part of the Atlantic Ocean.

Lophiocharon Whitley

Plumantennatus Schultz (synonym).

Lophiocharon caudimaculatus (Rüppell)

Antennarius asper Macleay (synonym).

The main character I used for the separation of *L. caudimaculatus* (subgenus *Lophiocharon*) and *L. asper* (type of the subgenus *Plumantennatus*) was a supposed difference in the bait, a simple tentacle in the former and a plumelike bait in the latter. I now find the nature of the bait to be variable, from simple to plumelike, and, therefore, I synonymize *Antennarius asper* Macleay with *L. caudimaculatus* (Rüppell) and the subgenus *Plumantennatus* Schultz (1957, p. 89) with *Lophiocharon* Whitley.

The usual color pattern of *L. caudimaculatus* is that figured by Schultz (1957, pls. 6, A, D, and 8, C) with or without an ocellate spot just behind the midbase of the soft dorsal fin; otherwise, the entire fish is brown-speckled or reticulated with brown. The chief distinguishing coloration, however, is in the caudal fin and consists of white or clear spots encircled with brown or blackish pigment.

The following specimens were studied at the Department of Systematic Biology, Stanford University (SU): SU 35781, Singapore Market, May 1937, A. W. Herre, two, 84 and 85 mm. standard length; 30652, Singapore, A. W. Herre, two, 52 and 80 mm.; 20204 (holotype of *A. lithinostomus* Jordan and Richardson), Cuyo, Philippine Islands, R. C. McGregor, 84 mm.; 39498, Singapore, October 10, 1940, A. W. Herre, two, 45 and 83 mm.; 30651, Singapore, March 14, 1934, A. W. Herre, four, 39 to 81 mm.; 27872, Sandaken, British North Borneo, July 3, 1929, A. W. Herre, three, 65 to 87 mm.; 32730, Singapore Harbor, May 7, 1937, A. W. Herre, three, 53 to 68 mm. At the California Academy of Sciences (CAS) (without number or locality), five specimens measured 57 to 92 mm.

Among the 26 specimens examined, I find that 6—SU 30652 (2), 32730 (3), and CNHM 47248 (1)—represent a black color phase described as follows: general background coloration black, tentacle barred, bait white; white saddle in front of first soft ray of dorsal fin reaching to level of eye; white blotches just behind corner of mouth, above base of pectoral fin, near tips of third dorsal spine, near tips of rays of caudal, pectoral, and posterior rays of both soft dorsal and anal fins; white bar between rear of bases of soft dorsal and anal fins, and another white bar across base of caudal fin rays; sometimes rear third of caudal fin white and posterior margins of pectoral, pelvic, anal, and dorsal fins white; a few circular white spots may, or may not, occur in black area on middle of caudal fin.

Antennarius phymatodes Bleeker

Antennarius oligospilos Bleeker (synonym).

In my review (1957), I recognized as distinct species *A. phymatodes* and *A. oligospilos* on the basis of characters supposedly shown in Bleeker's illustrations. Recent correspondence with Dr. Boeseman, along with information published by Dr. de Beaufort (The Fishes of the Indo-Australian Archipelago, vol. 11, pp. 204–206, 1962), conclusively show that *A. phymatodes* and *A. oligospilos* represent the same species.

These conclusions are based on the very close similarity of the holotypes of the nominal species as follows:

A. phymatodes Bleeker, RMNH 6285, holotype (illustrated in Bleeker's Atlas, plate 199, fig. 5, 1865), standard length 69 mm., total length 93 mm.; dorsal rays III,12, last 2 branched; anal 7, all branched; pectorals 10–10, none branched; pelvics I,5, last ray branched; caudal 9, all branched.

A. oligospilos Bleeker, RMNH 6286, holotype, standard length 63 mm., illustrated (slightly modified after the 68 mm. nontype smaller of two specimens in RMNH 25010) as plate 195, fig. 1, in Bleeker's Atlas; dorsal rays III,12, last 2 rays branched; anal 7, all branched; pectoral 10–10, none branched; pelvics, I,5, last ray branched; caudal 9, all branched.

Description of New Species

Phrynelox lochites, new species

PLATE 1

This new species of *Phrynelox* with short "bait" (about the same length as the second dorsal spine) from the Philippine Islands has as a cognate species its closest relative, *P. scaber* of the western tropical Atlantic Ocean.

Holotype, SU 38194, Dapitan Bay, Mindanao Island, Philippines, August 1940, collector A. W. Herre, standard length 48.5 mm. Three paratypes, all with same locality data as holotype: SU [number unavailable], two specimens, 33.5 and 40.0 mm.; and USNM 197325, 39 mm.

The following counts were made: dorsal soft rays 12, anal 7, branched caudal 4+5, in all specimens; pectoral rays 11–11 in holotype and in two paratypes, 10–10 in one paratype.

Measurements made on the types are recorded in table 2.

Bony part of first dorsal spine a little longer than the second dorsal spine, bearing at its tip the fleshy bait, consisting of two robust tentacles, each with numerous small papillae; skin just behind base of second dorsal spine naked; third dorsal spine movable posteriorly, tip

free, but bound down with skin anteriorly, and subequal in length to second spine; soft dorsal rays all simple except last one or two, which are branched; only last pelvic ray divided; caudal rays branched; anal rays all divided; pectoral rays all simple; gill opening close to base of pectoral fin; caudal peduncle distinct but short, slightly deeper than long; skin thickly covered with bifid to multifid prickles; scattered dermal cirri present.

Color in alcohol: head, body, and fins with light tan background; everywhere, except on underside of head and belly, with black spots or elongate blotches, arranged somewhat in lines on sides of body; black spots on fins round, those on caudal fin forming 4 vertical rows.

In the genus *Phrynelox*, this new species is a member of the subgenus *Phyrnelox*, which is characterized by having the "bait" formed of bifid tentacles. In this subgenus the species fall into two groups: (1) those species with the bony part (illicium) of the first dorsal spine notably long, almost twice the length of the second dorsal spine, including *P. striatus* (Shaw) and *P. melas* (Bleeker); (2) those species

TABLE 2.—*Measurements made on three new species of frogfishes (recorded in thousandths of the standard length)*

	Phrynelox lochites				*Antennarius*	
					indicus	*japonicus*
Characters	Holotype	Paratypes			Holotype	Holotype
Standard length in mm.	48.5	40.0	39.0	33.5	44.5	49
Greatest depth of body	495	625	590	532	548	530
Length of bony part of 1st dorsal spine	165	175	162	179	135	112
" " " " " 2nd " "	124	150	115	164	168	143
" " " " " 3rd " "	124	150	103	143	207	208
Longest soft dorsal ray	206	238	205	239	265	204
Longest (middle) caudal ray	289	337	318	338	355	335
Head (snout to gill opening)	474	575	640	686	524	550
Length of caudal peduncle (or distance between vertical lines through caudal fin base and rear bases of anal-dorsal fins)	103	112	103	119	115	69
Length of maxillaries	217	250	205	209	236	245
Least depth of caudal peduncle	124	145	115	119	153	133
Length of base of soft dorsal fin	454	550	474	538	540	517
Eye diameter	41	50	72	60	56	75
Interorbital space	144	132	141	134	157	106

with the bony part of the bait from a little longer to about the same length as the second dorsal spine, including *P. scaber* (Cuvier) of the western Atlantic and the black color phase of this species, known formerly as "*P. nuttingi* Garman."

All of the species of the first group that are known so far are from the western Pacific and Indian Oceans, whereas, in the second group, only *P. lochites* is found in the western Pacific, the remainder being found in the Atlantic. *P. lochites* differs from its closest relative in the Atlantic, *P. scaber*, in having the bait about as long as the eye diameter instead of its being two or more times longer. The only color difference noted is that on the caudal and anal fins, the spots being smaller and in more regular rows than those in *P. scaber*.

The species is named *lochites* ("lochites," masculine, Greek, meaning "lying in wait for their prey") to refer to the habit of frogfishes.

Antennarius japonicus, new species

PLATE 2

Holotype, SU 26796, Sagami Bay, Japan, collector A. Owston, only known specimen, 49 mm. standard length.

The following counts were made: dorsal soft rays 12, all simple or unbranched; anal 7, first 3 simple, last 4 branched; caudal 4+5, all branched; pectoral 10–10, all simple; pelvic rays I,5, last branched.

Bony part of first dorsal spine shorter than second dorsal spine, bearing a tuft of tentacles at the tip; skin just behind second dorsal spine naked; third dorsal spine movable and longer than second spine; gill opening close to base of pectoral fin; caudal peduncle distinct but short, deeper than long; skin thickly covered with bifid to multifid prickles; scattered dermal cirri present.

Color in alcohol: background coloration light gray with six round, brown-edged white areas; one on rear of head with two smaller round ones below, in front of pectoral base; another below space between third dorsal spine and origin of soft dorsal fin, and two on side of body; a large dark spot on body below bases of 8th to 10th rays of dorsal fin; color greatly faded but dorsal, anal, and caudal fins show traces of light brown spots; area above base of pectoral fin brownish, with light center.

Remarks: This species traces through my key of the Antennariidae (1957, pp. 53–62) to section 35a, but it differs at this point by having the first dorsal spine shorter than the second dorsal spine. Also, this species differs from *Antennarius pardalis* (section 36a) by having 12 dorsal rays, and from *A. pardalis* and *A. bermudensis* (section 36b) by having a distinctive color pattern of large round white spots.

The new species differs from *A. sarasa* Tanaka (section 33b) in having all dorsal rays simple and 10 pectoral rays, whereas, in the

Japanese species, 8 of the dorsal rays are branched and there are 13 pectoral rays.

Another species recorded from Japan, *A. nummifer* (section 51b), is close to this new species, but it differs in having all of the anal rays divided and the last 2 or 3 dorsal rays divided at their tips. The number of fin rays in the two species agrees but the color pattern of *A. nummifer* does not show round white spots like those of *A. japonicus*.

This species is named *japonicus* in reference to the country where the holotype was collected.

Antennarius indicus, new species

PLATE 3

Holotype, SU 40090, Vizagapatam, India, Dec. 25, 1940, collector A. W. Herre, only known specimen, 44.5 mm. standard length.

The following counts were made: dorsal rays 12, last 2 branched; anal 7, all branched; caudal 4+5, all branched; pectoral 13–13, all simple; pelvic rays I,5, last ray branched.

Bony part of first dorsal spine shorter than second dorsal spine, bearing a tuft of tentacles at tip; skin just behind second dorsal spine naked; third dorsal spine movable and slightly longer than second spine; gill opening close to base of pectoral fin; caudal peduncle distinct, deeper than long; skin thickly covered with bifid to multifid prickles; scattered dermal cirri present.

Color in alcohol: background coloration gray, with a dark spot in middle of side of body, belly plain light gray; anal and caudal fins with scattered dark spots; outer third of dorsal fin with 6 dark bars, and a larger dark spot between bases of 7th to 9th ray; dorsal surface of pectoral fin with dark spots except tips of rays white, underside of pectoral uniformly light gray; body appears to have had other dark markings, now indistinct.

Remarks: This species traces through my key of the Antennariidae (1957, pp. 53–62) to section 49b, but it differs from section 50a (*A. verrucosus*) and 50b (*A. altipinnis* and *A. pauciradiatus*) by having 13 pectoral fin rays, instead of 9–11, a difference thought to be of significance in this family. Among the various species referable to the subgenus *Antennarius*, only two have as many pectoral rays as 12 or 13: *A. sanguineus* from the eastern Pacific and *A. drombus* from Hawaii and Cocos Island. The caudal peduncle in both species is very short, its depth 2½ or 3 times its length, whereas, in *A. indicus*, the depth is 1⅘ its length. The lower sides and belly of *A. drombus* and *A. sanguineus* are dark-spotted, whereas *A. indicus* lacks spots ventrally.

The new species is named *indicus* in reference to the country where the holotype was collected.

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